REMARKS

Claims 1-2, 4-5, and 7-8 remain in the application. Claims 3, 6, and 9 have been canceled and incorporated into independent claims 1, 4, and 7, respectively. No new matter has been added.

Applicants gratefully acknowledge the Examiner's withdrawal of the rejection under the second paragraph of 35 USC § 112.

Information Disclosure Statement - 37 CFR § 1.105 Reply

In order to comply with the Examiner's Requirement for Information under37 CFR § 1.105, the Applicants have submitted all Swingby documentation in their possession in the attached Information Disclosure Statement. Below is the information requested in Paragraph 4 of the requirement:

1.) Rapid Design of Gravity Assist Trajectories, *Proceedings of the ESA Symposium on Spacecraft Flight Dynamics,* held in Darmstadt, Germany, 30 September - 4 October 1991 (ESA SP-326, Dec. 1991).

This paper gives details of some of the mathematics used by Swingby as well as details of the Swingby capabilities and design. It shows that the Swingby software tool had certain limitations which the present invention sought to remedy. At the bottom of column 2 on page 427 states that a goal of the Swingby program was "to use a simple targeting scheme with immediate graphic information for the mission analyst." In the second full paragraph of column 2 on page 428, the paper states:

> "The purpose of graphics, as mentioned before, is to supply immediate feedback to changes made by the analyst. In order for feedback to indeed be 'immediate,' the analyst must be able to quickly and simply alter the initial parameters. We have found that the simplest way to do this is with a 'pull-down' and 'pop-up' menu system. This allows the analyst to input data easily, check results, and then quickly modify the data and try again."

From the implementation portion of the paper, beginning at section 3 on column 2 on page 432 and continuing to the end of page 433, it is evident that Swingby enables the analyst to set up a single targeting problem, with variables (controls) and goals (constraints). This is a manual process, and Swingby can only save one such targeter-problem at a time. It clearly lacks

any teaching or suggestion of establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

2.) An Interactive Tool for Design and Support of Lunar, Gravity Assist, and Libration Point Trajectories, *AIAA/AHS/ASEE Aerospace Design Conference*, February 16-19, 1993, Irvine, CA (AIAA 93-1126).

This paper gives more detail of the Swingby capabilities and design. In discussing the "Analyst Module" on the first column of page 3, the paper states that "Swingby was not designed to be automated; it was designed as a tool with which the analyst would interact until the problem is solved." In contrast, the use of profiles and multiple profiles as presently claimed allows an analyst to create a simple profile for a particular sub-problem to quickly get a good estimate, which can then be automatically input into a second, more complicated profile to improve the results in an automated manner. See, for example, claims 2, 5, and 8. Indeed, as stated on page 1, lines 12-15 of the present specification, "this invention relates to a system and method for orbital planning that allows iterative calculations of orbital parameters to be accomplished *in an automated way* with one parameter solution serving as input to the next parameter's calculation." (Emphasis added).

As with the first paper, this paper also lacks any teaching or suggestion of establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

3.) Mission Analysis and Design Tool (Swingby) - User's Guide, Rev. 2, November 1994 (552-FDD-93/046R2UD0 CSC/SD-93/6071R2UD0)

This reference is the Nov. 1994 User's Guide that explains Swingby usage and confirms that Swingby can only handle a single targeting problem at a time. As with the first two papers discussed above, this User's Guide also lacks any teaching or suggestion of establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which

control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

4.) Operational Use of Swingby -- an Interactive Trajectory Design and Maneuver Planning Tool - for Missions to the Moon and Beyond, *AAS/AIAA Astrodynamics Specialist Conference*, Halifax, Nova Scotia, Canada 14-17 August 1995 (AAS 95-323).

This paper discuuses the operational use of Swingby, including its use with the Clementine and Wind missions. Again, this paper lacks also lacks any teaching or suggestion of establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

5.) Mission Analysis and Design Tool (Swingby) - The Swingby Tutorial, Update 2, September 1995 (DRAFT - 553-FDD-92-063R0UD0)

This final paper is a tutorial for use of the Swingby software and describes the execution of a single targeting problem at a time. In the tutorial itself, there are several concrete examples of the need to manually change the problem. For example, on page 3-9 and 3-10, which describes step 10, the user is instructed to select delta RA and Delta Dec as targets. Then, after step 12 and 13, on page 3-13, step number 14, the user is instructed to "switch off the lunar targets (Delta RA and Delta Dec)" and "Switch on the floating end-point targets." This is a clear example of the need to *manually* select go from one targeting stage to another in Swingby. Many of the other chapters in this document illustrate the same.

This paper also paper lacks also lacks any teaching or suggestion of establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

Claim Rejections - 35 USC § 112 - First Paragraph

Claims 1, 4, and 7 were rejected under the first paragraph of 35 USC § 112 as failing the enablement requirement since the specification allegedly lacks enabling support for "running **simulations** for each of the established profiles to provide a result representing a solution to the problem." Applicants traverse this ground of rejection.

Applicants herein repeat the arguments filed February 13, 2004 regarding how the invention solves problems and further submits the following arguments directed to the Office Action's new emphasis on "simulations."

As stated in the M.P.E.P., Section 2164.01:

> "even though the statute does not use the term 'undue experimentation,' it has been interpreted to require that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation. *In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404 (Fed. Cir. 1988). See also *United States v. Telectronics, Inc.,* 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) ("The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent **coupled with information known in the art** without undue experimentation."). **A patent need not teach, and preferably omits, what is well known in the art**. *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991)."

In the present case, running simulations to solve targeting problems was known in the art, as clearly demonstrated by the Swingby publications, submitted herewith, and therefore *should be omitted*. Indeed, even the Examiner states in the sentences spanning pages 4-5 of the Detailed Action in Paper No. 6 that "it is very well known, and often practiced in the art, to use simulation systems in mission planning." The Examiner's position is based upon the false premise that that the mathematics are somehow essential to the invention. This position is wrong. As demonstrated by the Swingby publications, many different mathematical methods (i.e., orbit integrators, trajectory targeting methods) can be used for space mission analysis, including Differential Corrector (DC), Quasi-Newton, and Steepest Descent trajectory targeting methods, and two-body, multiconic, Runge-Kutta-Nystrom, Cowell, and Runge-Kutta-Verner integrators. The invention does not depend on the mathematics used for the simulation.

As stated in the specification,"this invention relates to a system and method for orbital planning that allows iterative calculations of orbital parameters to be accomplished *in an automated way* with one parameter solution serving as input to the next parameter's calculation."

In the claims, this is accomplished by establishing profiles for each particular sub-problem of the problem to be solved, which involves specifying which of the previously selected control variables should be varied for each particular sub-problem, and specifying what results should be achieved for each particular sub-problem. By solving these profiles sequentially, the present invention automatically solves multiple problems in a single run.

A significant use of the profiles is for an analyst to create a first profile to allow a simple, initial targeting problem, such as one having one control and one constraint, which then converges and is used to automatically "seed" a more complex profile, such as one with two controls and two constraints.

Furthermore, the amendments to the specification filed February 13, 2004 included equations and examples that teach how to solve the propagation equations (e.g., Equations 1-6) needed to simulate the targeting problems. The Office Action attempts to address this material by alleging that "applicant's [sic] amendment appears to be an improper attempt at a continuation-in-part (CIP)." This allegation is clearly erroneous. Indeed, the amendment was filed in response to *the Examiner's explicit requirement* in Paragraph 3 of Paper No. 2 that "Applicant is required to amend the disclosure to include the material incorporated by reference." Furthermore, the Office Action lacks any rejection of the material as new matter under 35 U.S.C. 132, so the Examiner's arguments are erroneous.

For the above reasons, Applicants submit that the claims meet the requirements for enablement under 35 U.S.C. 112, first paragraph and requests reconsideration and withdrawal of the rejection.

Claim Rejections - 35 USC 102

Claims 1-9 were rejected under 35 USC 102(e) as being allegedly anticipated by Ellis et al. Applicants traverse this rejection. To anticipate a claim, the reference must teach every element of the claim:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must

> be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). See M.P.E.P. 2131

In the present case, the Office Action merely cites the portions of Ellis et al. that mention space missions, Satellite Tool Kit, and simulation, and erroneously alleges that the disclosed mission rehearsals anticipates mission planning, that the disclosed anomaly isolation anticipates solving problems, and that the "simulator disclosed by Ellis et al. allows the user to identify and select parameters and control variables via a command sequencer module." This rejection is meritless. As previously submitted, it completely fails to consider *the distinction between simulation and mission planning*. Although the use of simulation might be a subset of mission planning, mission planning is not a subset of simulation, but rather a prerequisite. Indeed, the fact that the input is known for a simulation whereas the search for the correct input is the purpose of mission planning illustrates that they are, ultimately, quite different.

The purpose of the Ellis et al. invention is to simulate satellite and ground stations. As it attempts to do this in "real-time" (see, e.g., col. 6: ln. 2; 6:17; 7:10; and 10:32), it is clearly simulating *a single set of mission data* at a time, much in the manner of Swingby only solving for *a single targeting problem*. All data parameters are known and commands are issued by the command sequencer.

In view of this, it is clear that Ellis et al. fail to disclose, teach or fairly suggest establishing profiles for each particular sub-problem of the targeting problem to be solved (and *has no need to* since the simulation data is already known) by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

Claims 1-9 were further rejected under 35 USC 102(b) as being anticipated by the MARC publication (hereinafter, MARC). As with Ellis et al., MARC is drawn to simulation, not mission planning. Although it can solve and display the results of thrust inputs, it is merely doing simulation and not solving a problem based on a desired result. It cannot solve for how long the user should apply the thrust to obtain a desired result, but only solve for the results obtained from the applied thrust.

Like Ellis et al., MARC fails to disclose, teach or fairly suggest establishing profiles for each particular sub-problem of the targeting problem to be solved by specifying which control variables should be varied and what results should be achieved for each particular sub-problem, and then running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved, as is presently required by all the claims.

While applicant will readily admit that the basics steps of

- setting up a control sequence that simulates a problem to be solved in the space mission;
- selecting control variables to be checked in solving the problem; and
- identifying parameters to be used in defining desired results that represent an adequate solution to the problem;

are arguably disclosed in the prior art Swingby documentation, there is no suggestion in either the applied prior art to Ellis et al. or MARC or in the Swingby documentation to further include the steps of:

- establishing profiles for each particular sub-problem of the problem to be solved; and
- running simulations for each of the established profiles to provide a result representing a solution to the problem to be solved.

Indeed, as previously mentioned, Swingby teaches using "a simple targeting scheme with immediate graphic information for the mission analyst" to allow "the analyst to input data easily, check results, and then quickly modify the data and try again." This simple, manual (non-automatic) system *teaches against the automation of present invention.* Likewise, Ellis et al. and MARC *teach against* the claimed "running simulations for each of the established profiles to provide a result to the problem to be solved" since they teach running a single simulation at a time.

In view of the above arguments, Applicant respectfully submits that claims 1-2, 4-5 and 7-8 are novel and non-obvious over the cited prior art.

Conclusion

For the reasons cited above, Applicants submit that claims 1-2, 4-5 and 7-8 are in condition for allowance and requests reconsideration of the application. If there remain any

issues that may be disposed of via a telephonic interview, the Examiner is kindly invited to contact the undersigned at the local exchange given below.

Respectfully submitted,

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